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Pela Alla Satearch Imberstary, Pala Alla, Callierala 95304;
Prom the low rithtude ertellite Pf8-1, carrow and aconstrour multiple packs here observed in the aconsy prefer at alesteent 5t to 1100 het precipifuling le the drift less rose from the fones tediation hele. Stouttneously certainment al the places may emprimed in many catter as the places may emprimed in many rater. The peach in flection energy at a rometime trace of the stouteness and the control to her order of 100 her side after the louitunest taulation in their cates traceal the inquest present a single and aconstiant cutoff in the first property of the places. The places may abservations in their cates traceal the inquest present of single and aconstiants emitting the places. The respectations of the 10 Alls to 25 the respe which are attributed to proceed hered VLF transitions of the yeak coursies of the louitunes. The release of the places countries attrough support the resolution of the yeak coursies with L rules and the mantly riemlian our and apartially carefunded extrem-head would irequire its attrough support the resolution that the nature prake is a feettow special course from a relation observed along the resolution of that the nature of the resolution of the transmission prake is a feettow special processing from symmetries attrough support the resolution that the nature of the support of the

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LITE SIGNALO NEAR THE EQUATORIAL ANOMALY CRESTS

M.C. Les [Regis Callege Research Center, Waston, Messenhusells 02193], A. DasGupta, J.A. Klehucher, S. Base and S. Easu

The nightlime pointleatlan liuctuations of linearly pointless 135 MHz satellits aignals received ot Aeranaion Island laceted near the equitarn areas of the equatorisi anomaly have been shown to be the manifestation of depointlession effect due to the differentive erattering by smail-small [200 m] density irrequistics with power-lew spectra. The freezy son eaplain its commissione with L-band saintilistion. The absence of this phonomenon at squalorial locations off the anomaly create le attributed to lwo feators (i) the ambient please densities are relatively low and [2] the propagation engles of astallite signals are more nearly perpendicular to the geomegnatic lisid. Depolarization, equatorial anomaly. Irregulacilies, L-band scintillation.

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HEAU 3 MEASUREMENTS OF THE ATMOSPHERIC POSITION

W. A. Habonsy (Jac Propuration Laboratory,
California Institute of Technology, President, CA
9109, O.O.A.) J. C. Ling and A. S. Jacobson

Ail appears assanted with the High Energy
Resolution Gamma-Ray Spectroscopy Exparians
(REAU C-1) on the third High Energy Astronomy
Observatory (EEAO 3) contain a strong lime at
111 kmV resulting from positrom conhibitation.

This line originates in the instrument Inself,
the earth's etmosphere and rounin sources, posribly including the dilluse cosmic background.
In order to understand the emission broadcast
increasing the atmospheric positrom annihilation
ing cosmission has been determined as a location
only goomspretic institude and results angle. Aithough the intensity of the first increases with
increasing institude, it see bound that varies loca
with aunits angle can be estimated they septimed
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of the instrument background have allowed as winth al 2.29 2 0.30 keV FMHM. Cherestoricks of the instrument betharound have allowed as upper limit of 9.4 x 10 channelon-sec-st to be placed on any energy (c 1 keV) diffuse cossic mission of 111 keV.

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**Editorial** 

#### Instrumentation Crisis for VGP

The sistua of geochemical/minerelogical inatrumentation is a matter of great concern. Not only is much of the preaent equipment obsolete and poorly maintelned because of ack of technical staff and money, there is elso greet conam about the pressing demends of new instruments (e.g., ynchrotrons, lon microprobes, high-energy mese specmeters). Probleme concerning thatrumentation pervade the entire field of science, and they are particularly severe recause of the cuta in the overell government budgats. These problems ere recognized by the Netional Research Council (NRC) end the General Accounting Office end ere the subject of several studies. The pressures on the Earth Sciences Division of the Netlonef Science Foundation have been pointed out by its director, Robin Brett, and there is extrema concern et the moment about the science budgets as opposed to the engineering budgets of NASA.

To study the atatus of geochemical/minerelogical inatrumentetion, an ad hoc committee of the Geological Sciences Board (GSB) of the NRC has been appointed by GSB chairman, William R. Dickinson. The members of this committee are cochairmen William W. Hey end William C. Luth: Gerald V. Glbbs, Joseph V. Smith, Georga R. Tilton, end W. Gary Ernst. Dickinson proposed the tollowing questions:

1. What, In fact, is the state of instrumentation nationally. i.s., is total inventory adequete end is it being used ef-

2 What can be done within the tremework of loreseeabla federal budgetery conetrainta to elleviate shortages that exist?

3. What is industry's potential role in addressing the overall funding problem?

4. Ara there naw creative or elternative methods for tinancing (f.e., in ecgulation, maintenance, upgrading,



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Gever, A woodcut by Fridtiof Nansen, oceanogrephar and poar explorer and Nobel Peace Prize Winner (1922), depicting himset sirolling on the tos with a triple curtain-like torm of the surora Seinead (from Nensen's Nord t, Takehelmen, 1911). Frontispiece tom Physics of Auroral Arc Formation, Geophys. Monegr. Ser. 10. 25 AGU, Washington, O.C. edited by S.-I. Akaaolu and J. R. Kan. For datella see p. 1155

replecements, etc.) thet might exploit eveilable reaourcae more setlatactorily?

la there a conceiveble role for idantifiad regionel research centera or shared arrengaments that offer ad-

vantagea so lar unexplored? Other queetions will be eddressed when they have been properly identified.

The first meeting of the ad hoc committee was held at Cincinnati during the GSA Meating. The second meeting will be held in Sen Franciaco during the AGU Meeting, and an opan intormsi sasaion will also be held during the AGU meating. The report of the ad hoc committee must be compleled by Merch 1962.

My own viewa, which ere tentetive, can be discussed under two major headings.

#### The Need for More Funding

Geochemical instrumentation is aeverely underlunded in relation to some other arese of scientific instrumentation. This is partly the result of the reletively simple instruments used in geochamistry up until the lest 20 years. Wherees nucleer and perticle physicists were already using expensive generators some 40 years ago and had developed large taams of engineers and acientists over the tollowing 20 veera, most geochemists, even loday, work in small independant leboratories that ere poorty equipped with technical staff and lacilities. Only some are lortunate enough to work in inatitutions with eccess to lirst-class technical serv-Ices. The problems become increasingly severe as certain Instruments (X ray diffractometers end electron microprobea end microscopes, for example) become absolutely fundamental to both research and teaching programs, while other instruments are being developed (e.g., pulsed neutron generators, X ray and ultraviolet light sources, high-energy mass spectrometers). Il overall funding is to stay level, or even to decline, I can see no way that all desirable goals can be achieved. Hence our long-term primary goal is to tind out whether the total lunding cen be increased in the tace of intense competition. Ultimately, this becomes a political and sociological question from which a wide range of views can be expected. No doubt some of you will speculate on the relative cost of scientific research and other hisman endeavors; In particular, expenditures on war and detense and on various drugs might be discussed. In the short-term (approximately 5 years), it seems likely

thet tederal end state lunds will prove to be strictly limited In theory, tex reductions for both Individuals and corporations ahould lead to a greater amount of disposable income. In preclice, gilts of either money or equipment will probably prove to be erratic unless a national sense of urgency trensletes into a major campaign of systematic donetiona. The Petroteum Research Fund of the American Chemical Society has been very efficient in dispensing research grants from Industrial lunds. Should an industrywide effort to disburse funds for research lactilities and instruments be organized in geochemistry? It seams totally impractical to organize glits from individuals, and efforts by individual institutions should prove more prolitable. But to be successful, there mual be e recognition by weelthy potential donors that scientilic reaearch, in general, and geochemistry, in perticular, needs a lot of help. Is it realistic to expect an individuel to donete a hall million dollars for a new electron microprobe at his or her alma mater, especially when university administratora ere trying to reise money tor leculty salarias and buildings?

#### The Need for improved Efficiency

Whatevar the chences of increesed funding, it is imperative to lind ways of using present equipment with greater efficiency. Probably eome diatinction must be made between 'frontier instrumenta' and 'besic instruments.'

About the only wey to save aubstantial emounts of money on new expensive instrumenta thet open up new frontiara is lo limit the numbar. This eulomatically leads to estabilishment of 'research centere.' i maintain that it is false aconomy to starve such e research center. Eech one ahould be enabled to compete on a worldwide level; in particular, if abould be staffed by first-rete people paid on, al least, a semipermsnent beaia inatead of on the more common calch-es-catch-cen basia. It may be possible to seve some money by joint development of instrumenta with scientiata in other countries. This has the additional psychological banefit of torging international friendahips in this ere of dangerous nationalistic feuda. However, it is a nulsance, et best, end a downright pain, at woret, for an outsider to work at a research center, even if the staff goes out of lia wsy to welcome and help visitore. To minimiza these problems, locations should be chosen to ease travel. Commuting by cer, bus, or train is cheaper and ganerelly easier

then overnight etays after long tilghts; futhermore there is leae dislocation of teaching end lamily life. There are many grave disadvantagea to 'research centers,' end I em sure that there will be considerable tealing against them. Henca, It is important to minimize the naed.

Turning to 'besic instruments,' there is much that cen be done. First, it is necessery to ancourage menufacturers to avoid unnecessery 'bells end whistles.' After some years of development, there is e danger that a beaic instrument becomes loaded with unnecassary trills. I believe that new electron microprobes ere becoming too complex end too expensive. Who needs a eervo opereted sample chamber powered by air compressora? Who neads an SEM tecltily on an electron microprobe used melnly for analyses on grains at leest 10 µm ecroaa? Let us urge construction of besic instruments whenever possible. Two instruments at \$250,000 can be better used than one at \$500,000. Second, exiating instruments must be kept in service for a longer period. Of coursa, it is nice to boest about the letest shiny pelni, but perhaps we should boast instead about the Puriten virtue of make-do-end-mend. Preventivo maintenanca and judicious rebuilding can work wonders on somo old instruments, but only it excellent technical steff ero in charge. In general, service from manufecturors is expenalvo end not always elticient. I believe that a university can make a profit by peying for n highly skilled cadre of techniclans who can handle essonlially nil instruments. Third, some instruments built before Itin computer ora con be upgruded successfully by addition of a computer and an interlaco. For example, a Picker, tour-circle X ray diffractemeter could be purchased lest year for \$12,500 and automated tor \$30,000 to produce an instrument superior in some respects to now ones costing over \$100,000. There are thoueands of X ray powder diffractomotors that can be automated by addition of a stepping motor, an interface, and a computer for botwoen \$15,000 and \$30,000; compare this with the \$80,000-\$100,000 for a new instrument. It is inportant to install some new instruments on a raquiar and continuing basis, but revamped older instruments can serva an important function, aspecially for teaching. I recommend that lunds be made avnilable for renovation and automation of as much existing equipment as possible. A carotil choice must be made of the type of equipment. Thus, some electron microprobas have such poor optical and vacuum systems that automntion is not worth the cost. Again, I emphasiza the importance of tirel-rate technical staff and tacilities, especially in teaching institutions, which are responsible for training a new generation of scientists. Fourth, I recommend that universities leach more courses on laboratory principles and practice. These might be statted in part by the technicians mentioned above. Scientific societies should consider giving short courses on new techniques and should arrange for dissemination of appropriate information on upgrading old basic instruments.

Other questions that should be addressed include 1. What should be the distribution of research lunds (e.g., trom NSF) between equipment costs and other

categories, such as salaries? 2. Is there a current shortege of trained technical staff? Whet are luture prospects for industrial recruiters?

3. Should there be coordination between government laboratories end privete institutions, and to what de-

4. Is it important to Itnd weys for U.S. companies to recapture instrument sales in erees now lost or almost lost to loreign companies (e.g., in X rey diffraction in-

struments)? 5. Should e program be established to cover costs of transferring older instruments from industriel companles end government laboretoriea to teaching institu-

tions both in the U.S. end ebroad? 8. Do some usere treet inatrumenta as 'black boxas.' and it so, ahould training progrems based on lundamental principles be established?

We enficipate e thorough review of the instrumenta in e representativa set of laboretoriee, and an appropriate questionnsire is being prepered. However, this will need to be supplemented by ea much 'enecdotal' information ee possi-

Please send your ideas, preferably in concise writing with formel permission to quote them in e final report. If you wich to phone me, please do so, il at all possible on a Wedneaday, at (312) 753-8632, 8:30 A.M.-7:00 P.M. I preler this devicer administrative and miscalianeous metters end try to keep other days for leaching and research.

> Joseph V. Smith President-Elect VGP Section

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geophysical monograph 25

**Physics of Auroral** 

**Arc Formation** 

S.-I. Akasofu and J.R. Kan, ethfor-

The polar aurora is investigated and a unified

physical model has beginn to emerge based on a great variety of observations and plasma studies

Auroral electric fields and field-aligned currents

Topics explored are

Morphology of auroral mics

Auroral electrons and mas

## News

#### **Earth Dynamice Study**

The 56 Investigators in NASA'e Crustal Dynamics Project met in September at the Godderd Space Flight Center to revisw the project, which will study the earth's tocionic plate movemente, crustel deformation, and rotational dynsmics. European investigators convaned October 30. Using precise geodetic date obletned with such space techniques as leser renging end redio Interfarometry, investigelors will study regional crustel detormation in Celttomio, Aleska, and other regions of high earthqueke activity; the current-dey reletive motton between the earth's major tectonic plates; the internal stability of the North American and Pacific pletee; end verletione in the Eorth's rotetion rate end position of its polar axis. The project will extend through

Two tschniquas heve been developed to make precise measursments between two points separated by large distences (thousands of kilomsters). The tirst involves lesor ranging to ertificial setetlites and to the moon. The LA-GEOS aalellite, leunched by NASA on Mey 4, 1976, into e nearly circular orbit at en attitude ot 5800 km, is a aphere whose surface is covered with 428 optical cube corner reflectors which reflect any incident optical eignal back to tho source. By eccurately end repentedty meesuring the time for a leser pulse to travel to the setellito and return, the position of the ground laser cen be determined with high accurecy. When similar measuromenta are made from a second etallon (which can be located on a different continent). the distance between the two stations can be determined with a precision of about 5 cm. Lunar rollectors were implanted by the crowe of Apollo 14, 15, and 18, and by two Soviot unmanned Luno missions. In addition to studies of the earlit, lunor laser ranging has provided valuable informetion on the dynamic motion of the moon and its orbit and has been used to atudy theories of general ratalivity.

The second tachnique, called Very Long Beseline Interleromatry (VLBI), Involves the anelysis of radio signals emitted by quesars and other celestial objects. These emissions ere received and recorded on magnetic tape by two or mora redlo telescopos separated by lerge distances. These signals are subsequently compered to determine the difference in the itmo of which the signals reached each telescopo, end the timo differences are analyzed to detormino the proclee distance botweon each of the stations. Currently, the precision of this technique is on the order of 3 cm. By making repeated measurements over a pariod of years, using both tachniquee, crustel motions as small as 1 cm per year can be determined. Current knowledge of the relative motions of the tectonic plates is based on paleomegnetic data and other intermetion and is averaged over the past severel million years of geologic time. These eversged rates are estimated to be between 1 end 20 cm yr. Using laser renging end VLBI, these movements can be directly measured for the first time, and tectonic models can be revised to reliect contemporary plete motion.

In California, Alaska, and other regions of high earthquake sclivity, the driving lorces of plete tectorics cause a buttdup of crustal atrein near plate boundaries. When the regulting etress exceeds the strength of the underlying materials, the stresa is releesed in the form of earthquakes or slow creep. A major objective of the Crustal Dynamice Project is to measure and analyze regional deformation and strein accumulation elong mejor plete boundaries euch as the Sen Andreas Feutt in Cslifornia, which separetes the North American Plate from the Pacific Piele. This will help us to underetand the basic mechanisms leading to earthquakes end eventually to the development of e relieble earthqueke prediction model.

In order to measure the eccumulation of crustet strain over an ective teclonic region, meesurementa must be mede at meny artea. NASA hee developed highly mobile systems, using both laser ranging end VLBI technology. which can easily relocate from one site to another within a metter of days. Mobile systems using VLBI techniques have been developed at the Jet Propulsion Laboratory, and mobile tasor systems have been developed at Goddard Space Flight Center and the University of Texas.—PMB 3

#### Hot Plasma Zone Near Saturn

invastigatore using data collected by Voyagar 2 during its flyby of Seturn this past August have i solar system containing the hottest ges yet observed. Temperatures in a region of spece eround Saturn ronga from 300 million to neerly 1 billion. C. The hot gas le an enormoue doughnut shaped region encircling Saturn at en eltitudo renging from 273,800 km above the planet's cloud top lo es high as 724,000 km.

The diacovery was announced at a colloquium at the Appiled Physics Loboratory of The Johne Hopkins University, Saltimore, by S. M. Krimigis, chief ectentist of the Applied Physics Loboratory Space Department, who is principal invealigotor of the Voyeger Low-Energy Cherged-Particle Experiment, which mede the observations. The measurements were analyzed by e teem that includes inveetigatore from The Johns Hopkina University, the universities of Maryland end Kansas, Bell Telephone Laboratories, and the Max Plenck Institute in Germany

'The temperaturea,' Krimigis said, 'ere about 300 timae holter than the solar corone, and twice ee hol as the Jupiter pleame cloud discovered by our instrument on Voyeger In 1979."

'The reason that the apacecraft survived paesag through this region, explains Louis Lanzeroiti of Bell Laboretories, a coinvestigator of the experiment, is that the densily of the ges is very email, only about 30 particles in e cublc loot; so, there were not vary many lons hitting the specscreft and haeting it up."

The low-anergy charged-particle Instrument is designed to messure last (e few thousand milee per second) long end electrons in the magnetospheres of the pienets end in the interprenetery medium. The instrument can distinguish ssverel slemsnts, such as hydrogen, hellum, oxygen, sulfur, sodium, and others; meesure the direction in which theee high-spsed particles ere moving; and the tempereture of this particls population when the pleama is very hot (Isns of millions of degrese). The instrument is also capebis of identifying the squivalent of the Van Allen belts and radietion zonss in the magnetosphere of the planets.

The region of apece eround Saturn occupied by the hot plasms torua aesms to be centered eround the orbits of Dione and Rhaa, two of Saturn's lcy moons, and to exisnd lurthar ewey from the planet on the dayside then on the nightsida. Krimigis sald. He also noted that in this region of space Ploneer II end Voyagsr I sxperimsnta hed shown the presence of a relatively 'cold' pissme (tempsretures of a lew million dagrees), which was a thousand times densar than the hot pleeme identified by Voyeger 2. No obvious explanation was offered tor the heating mechanism of this ges. [Source: NASA]-PMB &

#### New Water Year Hae Wet Start

Streemflow during October, the first month of the 1982 water year, was in the normal range over most of the country, but well-below normal atreemliow still persists in the Southeest, eccording to the U.S. Geological Survey.

The wetsr year used by hydrologists runs from October 1 of any calendar year to September 30 of the following calendar yeer, and it is designed to roughly follow the growing season end to begin end end during a period of generally low streemllow.

USGS hydrologists aeld that ebout 80% of the key index atelione reporting ecross the country showed normal to ebove-normel atreamilow during Oclober. By contrast, 6 months ego, more than hell of the key Index sletions reporting during Mey ahowed well-below normal streamliowwithin the lowest 25% of record, that le, 75% of the time, flow will be aqualed or exceeded.

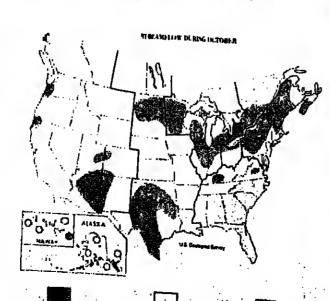
Although the nation's water resources picture is off to a ganerally wat stert for the new water year. USGS hydrologiste said that it will teke severet months of above-normel precipitetion to reverse the effects of the previous dry

Streamflow throughoul much of the Southeest remeins well-below normal. Flows of more than half of the key index streems from Virginia south to Florida and wast to Alabama were et well-below normel levels for October. Streemflow on ell four ksy streema in Georgia wes below normal ior the fourth straight month.

In contrast, above-normel streemtlow predomineted in e brosd regional bend from New England through the Greet Lakes stetes and Into Minneeote and North Dekote. Lergs sreas of ebove-normal streemflow were also reported in Ar-Izons and New Mexico end in Texas and Oklahoma, where eevere flooding boosted flows of meny streams.

As en Indication of the generally hesithy water eltuation In much of the United States during October, combined llow of the nation's '8ig Five' rivers (Mlaeissippi, St. Lewrence, Ohio, Columbis and Missouri) everaged 483 billion gallons a dey (bgd), ebout 2% ebove normel. The combined flow of these rivers has been in the above-normal range now for five streight months. The Big Five rivers eccount for elreemflow runoff in about half of the conterminous United States and provide a useful check on the etetua of the netion's weter resources.

Individuel flows ot the 8ig Five tor October: Mississippl Rivar neer Vicksburg, Misa., 178 bgd, 5% below normal and 21% below September; St. Lawrence River near Massena, N.Y., 193 bgd, 17% above normal and 1% above September; Columbia River at The Dallea, Ore., 55 bgd, 7% below normal and 8% below leat month; Ohlo River at Louisville, Ky., 23 bgd, 2% below normal end 20% below September; Missouri River at Hermenn, Mo., 34 bgd, 12% below normal and 5% below lest month. (Photo credit: U.S. Geological Survey, Department of the Interior.) 33



Below normal

(within the lowest 25

Above normal

within the highest 75

Conference Reviews R&D Budget

About 85 university officials, leboratory directors, industriel reaearch executives, scientiste, and engineers gathered In Washington, D.C., et the invitation of Nationef Academ of Sciencea President Frenk Press, to discuse the outlook for and the implicatione of the federal research and devel opment budget for fiscal 1982 and beyond. The consersus of the group is that President Reegan's proposed 12% across-the-board cut, if effected, would saverely damage eclence; that the White House should review reaearch funding to meks more productive use of reeeerch dollars: thet eclence end technology are vital to the Rsagan edmin latration'e goale; and that baalc research should take priorty over development.

George A. Keyworth, director of the Offics of Science and Technology Policy (OSTP), and Fred Khadouri, essoclate director for natural resources, energy, and eclance in ths Office of Management and Budget (OMB), also stiend ed the meeting on October 28 end 27. They advised the group to be realistic and not assume the worst ceae. In asdilon they told the conference that during this pariod of iscal reetraint growth will be reetricted; nevertheleas, science will be treated with seneltivity.

Fearing, however, that the restricted growth essociated with the budget elicing will irrevocebly herm science, the conterence perticipants volced their concerne to the Admin Istration and Congress. Press emphasized that the gather ing was not e confrontation or a lobbying effort.

Reagan'e proposed reductions will do Irreversible damege unless longer-term research, in contreat to development end demonstration, is protected, according to a side ment leeued at the conterence's conclusion. As examples, the essembled scientiets pointed out that young investigators, early in their cereers, would not receive support for their work. In eddition, science teems would be broken epert, and the poor opportunities perceived by young pecple would reduce the supply of scientists.

This menpower problem concerns industry the most, according to Keith McHenry, vice president for research and devalopment at the Amoco Oit Co. Henry Feshbach physics department chairmen at the Meeeechusetta Instituts of Technology, noted that in the physical sciences the manpower numbers will be back 'to the pre-Sputnik era' it the proposed cuts ere epproved. Press added that such etent would not be eesliy reversible because the cycle for building end rebuilding science approximates 5 to 10 years.

The conference perticipants also agreed that continued cound investments in reacerch and development by the tederal government are esaentiel to our netional goals." Their stetement conlinued, 'Because of the important relationehip between research, technology, and increesed productivity, the expressed goels of this Administration for a strong economy end improved national security demand more, rather than lese, investment in basic research.

While recognizing the need for tightening the faderal money bell, the perticipents urged the Adminiatration and Congress to teke an ecross-government view of R&D end to make budget adjustments while maintaining the basic sciencee. OM8 end OSTP were suggested es cendidates for performing euch a review. The group also asked that the government recognize that 'education in the adisnoss's inextricebly linked to research' and urged that graduets student eupport be continued through research grants, fellowehipa, and traineeahips.

Substituting a large part of government support with induatry support wae not en acceptable solution to the probiem. The growing relation between universities and industry is leudeble, and the nation can only benefit from these partnerships. Yet, the scientiets egreed, 'such a relation cannot become a substitute for the strong govammant-university partnership in support of besic research which now exiats.'—BTR &

## Memorial Fund for Henry Faul

The University of Pennayivania has established a memorial tund to honor Henry Faul, professor ot geophysics. The fund will be used to remind future generations of Penn geclogy etudents of the effective end uniquely personal isad ership role Henry played in the geology depertment during the last 18 years, according to Robert Giegengack, dsparment chairman. Faul died on September 16.

Contributiona may be made to the trueteea of the Univerelty of Penneylvania for the Henry Faul Memoriel Fund, co the Department of Geology, University of Pennayivania, Philadelphia, PA 19104. 38

#### Geophysicists

Gordon J. Bell, 57, dled on Mey 8, 1981. A member of the Meteorology Section, he Joined AGU in 1974. John D. Hale, 88, died on April 17. A member of the Tectonophyeics eections, he joined AGU in 1948.

Lloyd Herrold, 73, died on September 16, 1981. A Life Member, he joined AGU in 1935. He was e member of the Hydrology Section. Henry Hampia, 89, died on October 13, 1981. A Life

Member, he joined AGU in 1933. He was e member of the Geodesy Section. Jorgen Holmboe, 78, died recently. A Life Fellow, he Joined AGU in 1938. He was a member of the Meteorology

Slephen W. Nile, 77, dled on February 22. A member of the Selemology section, he joined AGU in 1947. Garit H. Toebes, 54, died recently. A member of the Hy drology Section, he joined AGU in 1968.

## **New Publications**

Modern X-Ray Analysis on Single Crystals

Peler Lugsr, Weller de Gruyter, New York, 312 pp., 1980. \$48.00 (clothbound).

Reviewed by Peul B. Moore

Ons mey eak 'Why a nsw book on cryetal structure enalysle?, end jualitlebly so. I was brought up on thet great daselc X-ray Crystallogrephy by Mertin Buergsr, writtsn soms 40 years ego. It was, and still is, a gold mine of intormailon, meny tadious celculatione of which Busrger did himself. But crystellography as science has its own eutoimmune system. The science has become so tundamental and automated in repid information ratrievel that it is now a servant to other sciences. Crystel structures are aclyed no longer for their own sake but for the increase of knowledge at the chemical bond in whatever field it may be.

Thia praity little book with its cartoons of baby's head and symmetry operations eround it is ideal for the modern student who will probably use crystallography as a tool. Consider the chapters: metrices, vectors, diffrection theory (52 pp.), film melhods, X-reys, choice of apperatus (59 pp.), cryelel symmetry end space groups (85 pp.), dittractomsisrs (29 pp.), phase problem (62 pp.), and retinement (36 pp.). Eech is a good, thorough distillate of earlier works. Flow diegrams of symmetry operations appear, oflen some-pege encapsulation of what would tormerly constituls a whole trealise. Most Importent for this book is e considerable discussion on computer-assisted structura analysis: direct methods end refinements. Smell (but to the scientist, often crucially importenti) detella are not lett out, la example esaeseing cryelal quelity

In cryatel structure anelysis, es in other sciences, 'the mills of the gods grind slowly, so es yeers pase, new and glever shortcute are diecovered. There is no competition: the world has two places. There are pleces for Buarger's classic work and for Lugar's compact little book, which, by the way, generously refere to the varied clessics in that field. This would be an excellent book for e greduete course in chemistry, geochemistry, etc., on e powerful and

Paul B. Moore is a profassor in the Department of tha Geophysical Sciences at Tha University of Chicago.

AGU Geophysical Monograph, vol. 25, Physics of Auroral Arc Formailon, is based on the proceedings of the Chepman Conference on the Formation of Auroral Arcs. The conference was financially supported by the Netlonel Science Foundation, NASA, the Air Five Geophysical Leboratory, and the Lockheed Rasearch Leboraiory. The following essey, written by the conference covener, surveys the aubject of the conference.

#### Physics of Auroral Arc Formation

S.I. Akasotu end J. R. Ken (Eds.), Geophys. Monogr. Ser., vol. 25, AGU, Washington, D.C., xil + 465, 1981, \$25.00.

The aurora hee been one of the most challenging problems in geophysics, but it has finelly begun to yield ite secret. The polar aurore eppears in a narrow belt celled the auroral ovei, which surrounds the geomagnetic pole. A woodcut of the surore by the grest polar explorer Friditot lensen (see this week's cover of Eos), tiluatrelee, fairly acuralsly, the thin curtain-tike torm of the aurore, extending from the zentth to the horizon. When this curtein-like torm s observed from a diatant point outside (south of) the oval. appeare as an arch-tike lumtnosity above the northern hofice. It was this particular torm that was officially claeaffled as an 'erc' by Carl Slörmer, who produced the firet catalog of the auroral forms. This is the origin of the term arc, athough we now use it to describe the curtain-like discrete

There is little doubt that the aurora results from an elecifical discharge procese powered by the eoler wind-megneosphere dynemo. It has eleo been found that there existe e

potential drop of the order of a tew kilovoits along euroral tield linse, which is largely responsible for the acceleration of auroial perticles. Until asverel yeare ego, it had been thought thet a itsid-etigned potential drop was extremaly

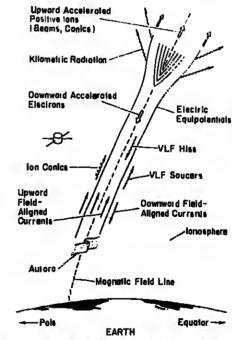
These remarkeble advances in aurorel physics during tha last severel years ere a reault of extensive obasivetiona of auroral perticiaa, tield-silgned currenta, and electric tields. as well ae theoretical studies of the reletionable among theas obeervetiona. In July 1980, an AGU Chapman Conference was hald et the University of Aleske to discuss the

aubject of the ecceleration process of the eurorel particles. Two importent gosis were sst for the conterence: (1) identification of possibts plasma processea that can be reaponsible for the csuse of the potential structure, and (2) sxchenge of idsss, among theorista end expsrimantera, on relevant plaame proceaaas.

and theoretical atudias have contributed to reveating the geometry of the eurorel potential atructure. Aveileble observettone euggest thet equipotential contoure in a meridien plane croes aection of the structure ere V shaped or S shepad or a combinetion of the two. For the V shaped gaometry, electrons will be eccelereted more elong the center lina than elong tta northam end southarn skirts. It appears that the V shaped potential structura has at least two scale aizes: The that hae e letitudinet scale of a tew hundred kilomaters, and the second has a latitudinal scale of a few

There was little doubt among the conference participants lhet the electric currente elong geomegnetic field lines (tield-eligned currents) ere closely associeted with the tormation of potential structure. It is fikely that there is a limit to the current denaity (-10-6 emp/m²) of upward (tialdaligned) currents cerriad by magnalospheric alsotrons owing to the mirroring of these electrons as they descend towerd the poler lonosphare. Howavar, whan the solar windmagnetoephere dynemo Imposaa more than the limiting current density, the magnatosphara-lonosphera systam dovelops a potential drop to allow the elscirons to carry mora current to the lonoaphere.

shocks, differential plich-angle anisotropy, anomalous rasis tivity, and others es posalbla mechanisms to supporting the potential drop along liald lines. The importance of a double leyer in accelerating auroral particles was suggested liret by H. Altvén many years ago On the other hand. the pitch angle anisotropy is en Important ingredient in ex-



unilkely to occur in e colliaionisss magnetospharic plesma.

in tact, this was avan a 'torbidden' thought for many yeare.

 Models of our neal potential structures and energization of auroral particles

During the last decede, several interesting observetions kitomatera or less embadded in the larger-scala ona.

In the pest we heve identified double layers, electrostation

Fig. 1. Schematic illustration, showing some of the interesting teatures associated with the auroral potential atructure (courtesy of

 Shnutniloa of space plasma phenomenou Numericul simulation of nororal potential structures and releted problems Plasma waves observed on ouroral field lines and in • Theoretical studies at waves and turbulence in auroral ptasme 472 pages . Mustrated . \$25.00 orders under \$50 ( 7 1/5/ 20% member must be prepaid of American Geophysical Union 2000 Honda Ave. NAV Washington, D.C. (2000)

tending the tield-aligned scale length of the double layer Further, enomalous resistivity may provide additional potenhal drop in the double tayer

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There are e number of fascinating phenomena associated with the auroral potential structura. They are wall summarized by Figure 1. These phenomena serve in diagnosing plesma processes that are leking place in the auroral polential structure. For example, during the conterence, experimenters and theonsts came close to the agreement that the aurorel kilomatric radiation (AKR) is generaled by gyration of electrons trapped in the euroral potential struclure. Therefore, the spectrel characteristics of the AKR provida important information on the trapped electrons, which are important for meintaining the double layer potential. It should elso be mentioned that the epectre of auroral electrons are not necesserily in luli egreement with what the polantial structure predicts.

It was fortunate that several plasma physicists participeted in the discussion of plasma proceases associated with the lormation of the auroral potential structure from a venety of viewpoints, including computer plasma simulation studies end laboretory experiments. In the history of magnetospheric physics, it may be that the euroral potential structure is the tirst subject so comprehensively studied by workere of diverse expertles. Many perticipants recognized the usefulness of computer simulation studies of spece

One of the most importent tuture problems will be to understand the formation of the euroral potential etructure as en integret part of the magnetosphere-ionosphere system. rathar than es e plasme region isotated from the reet.

> S.-I. Akasofu Geophysical Institute University of Alaska

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pointments at the High Allitude Observatory are available for new and established Ph.O.'s for up to one year periods to carry out research in solar physics, solar-terrestrial physics, and related sub-jects. Applicants should provide a ouniculum vitae including education, work experience, publication in armes of three educates tamiller with their work, and a slatement of their research plane. Applications must be received by 16 Jenuary 1982, and they should be sent to: Visitor Committee, High Altitude Observatory, National Center for Atmo-apheric Research (NCAR); P.O. Box 3000, Boulder, Colorado 80307, NCAR is an equal opportunity/alflimative action employer."

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Geophysicist. The Air Force Technical Apolicaon Center (AFTAC) is seeking candidates for 8 staff geophysicisi to supernee research in nuclear test descript estimology and hydroscoustics. Du-lies include in-house research on discrimination be-tween earthquakes and explosions, technical supervision of contractor research, and advising man-agement in the candidate's area of expertise. AFIAU is located at Paintok AFB, Florids, Grade level GS 1313-13, salary \$33,686, Serid e current SF 17t by December 2, 1981 to Huntaville Area Office, Office of Personnel Management, Southerland Bidg., 806 Governots Orive, S.W., Huntaville, Alebama 35801. For more information, call T. Eisenhauer (305) 494-2761.

Research Associate/Theoretical Physical Oce anography. Applications invited for two post-doctoral research associate positions in the School of Oceanography, Oregon State University. Appli-cant will conduct research in theoretical modelling and observational comparisons of ocean circula-tion. Ph.O.: in mathematics or the physical sciences. Submit resume, brief statement of research interests and three relatences by 1 January 1982 to Prof. Peam P. Niller, School of Oceanography, Or State University, Corvality, Oregon 97331.

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ing altibules: demonstrated crontivity and promise of excellence in research and teaching, intent to develop a vigorous gradunto resparch program, deairs to teach courses in hold of interest and ruloted tields of geoscience et undorprodualo and Urndvato

levels
Send resume, statement of luture research interests, and names of at least three references to Enry Haskin, Chairman, Oppartment of Eerth and Planetary Sciences, Weshington University, St. 1994, 440, 62120, Applications, received through Louis, MO 63130. Applications received through February 15, 1882.

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Matsmerphic Gaologist. The Department of Earth Sciences of Montana State University onticipoles a new position in geology end invites applica-tions for a tanuro track position at the assistant profeesor level beginning either June or Soptembor, t882 We sook a liold-onented metamorphic gaoto Ost. A background in aconomic geology or tocton-ics is desireble. Candidates must be interested in teaching introductory geology and undergreducte mineralogy-petrology courses, and will be expected to participate in automata find leadership. minarangy-perology couraes, and will be expected to participate in summer fuld instruction. Completion of Ph.D. prior to appointment is strongly proferred. Our department has 11 faculty and is multi-disciplinary 6.S. options in goology, geophysics, geographical planning, geography, and moteorology and an M.S. option in geology are currently ollored.

Sent resume, transcripts, and threa fetters of recommendation by Fobruary 10, 1982 to: Dr. Rob-ert A. Charwick, Department of Earth Sciences. Montono State University, Bezonnin, MT 59717. Montons State University to no offirmative action.

Physical Connographer. The School of Priyers i Ceaanographer. The School of Oceanography, Oregon State University, is soliciting applications for an assistant or essociate professor, depending on experience. Applicants may be observationalists or theoreticians, but must have a Ph.O in the physical sconces and have demnistrated objects to conduct independent behaviorable. strated ribility to conduct independent high-quality research and obtoin research funding. Outless include teaching and supervision of graduate stu-dents interested cendidates about aubmit a resumo and names of three references by 1 January 1982 to G. Ross Hoath, Dean, School of Ocoanog-raphy, Oregon State University, Corvellis, Oregon

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The successful cendraste must have the following attributes demonstrated creativity and promise of excellence in research and training; infont to davelop a vigorous graduata research program; de-see to teach courses in field of interast and related helds of geoscience at undergreduete and greduate

Send reaume, statement of future rosearch interests, and names of et least three references to Larry Haskin, Charman, Oepartmani of Earth end Planatary Sciences, Washington University, St. us, MO 63130 Applications received through

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For Further Information Robert Hargraves, Chairman, Search Committee, Department of Oeological and Geophysical Sciences, Princator University, Princeton, New Jersey 08544.

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Faculty Positional Earth Ociences. SUNY Stony Brook is seeking cendidates for two tenure track appointments and one or more visiting prolea-eorahipe for the academic year 1981–82. Fishk and solery are dependent on experience and qualifications. Aroas of specialization for the tenure treck osibons includo alructural geology, teclonophyelcs. Goophyaks, mineralogy, pairology, geochemistry, and mineral rosources. Oullaa include teach ing greduete and undergradueta courses and con-ducting original research. The areas of spectal-ization for the visiting professorships are: mineral-ogy, cryatallography, or mineral physics. Sand resumoe and namos of three roferences to: Professor Gilbert N. Henson, Dopertment of Earth end Space Sciences, SUNY Stony Brook, Stony Brook, NY

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Structural Gaofogist/University of Wyo-ming. The University of Wyoming, Department of Goology and Ocophysics sooks applicants for a tonure track appointment in atructural geology expocted in he evallable heatrning fall cornester 1982 or earlier. Dulies will include leaching of underginduallo and graduato coursos in struckiral goology, expervising MS and PhO thosos, and research in structural geology. Appointment of assistant profes-sor level is prateriod, but a policians requesting ap-pointment at higher mak will be considered. Selary open. Applicants must have PaD degree and be versed in quantitative theory as well ea field applicritions or modern structurol Qaology and regional

Applicants should provide, by January 1, 1982, a resume, three letters of reference, and a fetter of application including a statement of current research interests and courses which the applicant pols qualified to toach. Applications abould be sent

Dr. Robert S. Houston Hand Department of Occlogy and Occupiesics University of Wyoming Leramio, Wyoming 82071-3006. The University of Wyoming Is an equal opportunity affirmative nation employer.

Research Associate Position University of Arizona. The Lunar and Planetary Laboratory enticipales that a postdectoral position will become available in Jenuary 1982 This is eone yeer, nonrenewable position. The position will involve labora-tory studies of the intrared spectral reflectances of malocydes, terresinal silicates and icaa These dete will be used for interpretation of high-resolution spectre of astaroids and other planel satellites. Appicont should have experience with IR opectro-meters et the telescope and in the laboratory.

Vita, bibliography, and three letters of reference should be sent by December 31, 1981 to: Dr. Larry A. Lobolsky Lunar and Planetsry Leborelory

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University of Hawsili Faculty Positions.
The Department of Oeology and Ceophysics and the Hawsii Institute of Ceophysics of the University of Hawsit are seaking applicants for two tenure trock positions becoming available January 1, 1982. Applicants should have appealization in (1) mame geophysics with amphasis a certain of (1) 1982. Applicants about have specialization in (1) marine geophysics with emphasis in one or more of the fields: menne seismotogy, megnetics and gravity; or (2) marine geology sedimentology. One of these positions will be liked et erient of full professor, the other et assistant or associata level.

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App:cants should have demonstrated obity to conduct and promote marine research commensurate with the level of the application. Ability to teach stall levels is expected. The positions will be joint ones on an 11-month basis with the Oepertment and the inshirts and will involve both leaching and research responsibilities. Apply with resume, axpected level of appointment and the names of 3 referees to Chairman, Personnel Committee, Department of Geology and Oeophysics, University of Hawaii, Herioliulu, Hawaii 96822

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Enginearing Gsafoglat/Gsophysiolst.
The Department of Ocological Sciences, University of Saskatchewan, has a vocant tanureble position in aginearing geology/geophysics. Applicants ahould be quelified in leach undergraduate and graduate courses and to conduct research in engineering and the conduct research research in engineering and the conduct research resear preupose courses and to conduct research in engineering geology. A background in structural geology may be appropriete. Well-equipped lacilities ere available for research in rock mechanics, fluid flow inrough porous madie, ecousite, and electrical properties of rocks, and permairosi. Good opports properties of rocks, and permatrost. Cood opportu-nities exist for joint research with qualifications and experience. Gend applications, datalled personal resuma including the names of at least threa reler-ess, and other aupporting data to Dr. W.O.E. Cald-well, Head, Department of Oeological Sciences, Univaroity of Saskatchewan, Geekatoon, Saskatch-ewan, S7N DWO. ewan, S7N OWO.

Please note: until November 15, 1981 consider alien will be given only to applicants who are Cane-dians or lended immigrenie, etter that date ell appli-cations will be considered.

Patrologist-Economio Mineralogist/Univar-sity at Oklahoms. Applications are invited for a tenure-freck position, effective September 1, 1982 at the asatstani professor level, in petrology and at the assistant professor level, in petrology and aconomic mineralogy. The successul applicant is expected to teach graduate courses in his/har apacialty, to help teach undergraduate courses in minoralogy-optics-petrography, and to pursue an active research program. Consulting and interacting with mining companies are encouraged.

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commitment to diversify the program in the School of Ocology & Ceophysics. As a result five tenure-track positions are open for the left of 1882. Six naw laculty were added to the School in the fell of 1883. 1981 | Innging the total full-time faculty to 15), and an additional oix positions will be evallable during 1983-1985. A new building that will house the

1833-1835. A new building that will house the echool is in the design stage, and the successful applicant will perticipate in equipping it. The Ph D. degrea is required for this position. Praterance will be given to petrologists with a strong chemistry background and with a demon-etrated interest in the economic geology of matallic and non-metallic mineral deposits. Qualified appli-cants should arrange in another process. cants should arrange to send transcripts of all col-fege and university work, resume, statement of re-search interests, and three letters of reference to: search interests, and three tetters of reference to:
Dr. Maryellen Cerneron, School of Oedlogy and
Ceophysics, University of Oklahome, Norman,
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Candidata must be abla to teach courses in invertetion, and historical geology. Additional expertise in recent marine anytronments highly dasirable.

Applicants are expected to do recearch in their

araas of axpertisa, and to lead students flaid Irips. araes ol axpertisa, and lo lead etudenta' fiaid Irips. Strong teaching end research commitmente expect-ed. Oubmit applications with rasume end copies of transcripts, end have three lefters of recommanda-ilons asni to the Chairperson, Oepartment of Earth & Space Sciences, Indiana University-Purdua University et Fort Wayne, Fort Wayne, Indiana 46805, Indiana University-Purdua University is en equal opportunity/effirmative action employar.

Patrology/Qaochamistry: Fiorida Interna-tional University. Applications are invited for one tenurs frack position (assistant protessor) available from August 1982. The successful candi-date will be expected to leach at the undergraduals level and busine a viogram respents provens. The date will be expected to leach et the undergraduala level and pursue a vigorous research program. The applicant should have a background in pelrology and geochemistry. Highly qualified candidates in the areas of geophysics or hydrogeology may also be considered. Applicants should have a Ph.D. degree. Closing dete Merch 15, 1982. Applications including a curriculum vites, research interests, and three letters of reference should be sent to:

Dr. Leonard Kellar. Chairman, Department of Physical Sciences, Florida International University. Tamiami Trail, Miami, Florida 33199.

Fild is a member of the State University System of Elorida and is an equal opportunity/affirme live.

Physical Ocsanographer. Royal Rosds Mil-tary College axpecie to have a tenure track vacan-cy in Oaperiment of Physics effectivs 1 July 1882. Candidales should hold doctorete or near declorate in physical oceanography preferably with experi-ance in digital hardware and microcomputer applicalline. Appointment experied to be made at se-elstant professor fevel but selary and rank depandent on quelifications and expertence. Relocation expenses cen be provided. Outles include under-graduate leaching in physics and physical ocean-ography, and reseerch in merine eclencs. Applications should include complete dossiar end names of three retarences and be sent to: Or. E.S. Orahem, Principal, Royal Roade Militery College, FMO Victorie, S.C. VOS 180.

This competition is open to both man end wom-en. Knowledge of English only is required. Only Calen citizena or Landed Immigrants need apply. Toute information relative a ce concours así disponible en françale et peut être obtanua en écrivant

laws Blate University of Octance and Teshnology/Depertment of Earth Sci-

Applications are invited for two tenura track faculty positions. The renk for each te at the assistent or clate professor level, dependent upon qualificallons. The successful epplicants will be expected to develop strong research and graduata student programe. Teaching duties will include undergraduate and graduate coursea in the areas of experies.

nerel Resources Economic Geology: One posttion is in mineral resources/economic geology. An applied field orientetion is preferred. Iowa State has astablished a Mining end Mineral Resources Re-eearch inatifule and an interdepartmental minor in Mineral Resources in order to support and develop research and education in this area. In addition to the appointment in the Department of Earth Sci-ences there will be full opportunities to interact with these progrems.

Geomorphology: The second poeition is in the general field of geomorphology. Additional expertise in an area related to geomorphology, such as groundweler, engineering geology or remole sens-ing is also desired. A person with an applied field

Ing is also desired. A person with an approvement orientation is being sought.

Eech appointment will be on an academic year basis, Opportunities are evelleble for euromer teaching appointments. Salaries will be commensurets with qualifications. Application deadlines for both positions are February 15, 1982; later applications will be accepted if a position is not titled. Fosttions will be eccapted if a position is not titled. Posi-tions are both currently aveilable and are expected to be filled no later than the to be filled no leter than fell, 1982. For epplication

information please write to: Bart E. Nordile Department of Earth Sciences 263 Ocience I lowa Slele University Ames, lowe 50011 lows Siete University is an equal opportunity/aifirmative ection employer.

Selsmologist/University of Uteh. Seach extended; the University of Utah is expanding its geophysics program in the Ospartment of Osology and Oeophyeics by adding a tenure track faculty member in selamology at the assistant to associate specialties in eeismic reflaction, aeismic imaging. and theoratice! asismology will be given preferen The individuel will be expected to feach undergraduels and graduele courses, and to pureue en active research program with graduate etudants. The depertinent has modern teaching and research pro-grams in geology and geophysics, and has close associations with the numerical enginese and date processing groups in computer science, electricat angineering and mathematics. The geophysics mponant of the department has strong research and teaching programa in seismology, electrical lagnetic methode, thermat properties of the earth, end potential fields. Current research in selsmology includes: aelemological and aarthquake raesarch utilizing a naw POP 11/70 computer with plotter and larminale; monliering of the intermountain seismic ball by a 55 station laternatured network utilizing a new on-line POP 11/34 computer major experiments in eelemio retraction profiling in vestigations of aelemio propagation from synthetic selamograms; application of Inverse theory to set motogy, eelemio properties of voicenio systems and alliant research. allied research in tectonophysics. The closing date for applications is December S1, 1881. A Ph.D. is required for this position. Applicants should submit e vite, transcripts, a letter describing his/her,research and teaching goals, and names of five persons for reference to Williem P. Nash, Chairman. Ospariment of Geology and Osophysics, University of Utah, Salt Lake City, Utah 64112. University of Utah le an equal opportunity/effirma-tive action employer.

asses and phenomene in the sea. Yale University is an equal opportunity/affirmative action employer and ancourages women and mem-bers of minority groups to compete for this position. Curriculum vites, publications, and the names of hies or more referees ehould be eant by 31 De-cember 1991 to: Robert B. Cordon, Chairman, Department of Oaclogy and Oeophysics, P.O. Sox 8668, New Haven, CT 05511.

Qeophysical Fiuld Dynamic ist/Physical Desenoprepher. Applications are solicited for a jurior faculty position in ocean physics or dynamics to begin in the academic yeer 1982–83. Areas of interest to the Department include analytical, nu-

merical and laboratory modeling of physical proc-

ringaton University/Weter Resources Program, Department of Civil Engineering. Department of Civil Engineering Invites applica-tions for e tenure track, three-year appointment at the assistant professor rank baginning on or before September 1982. Responsibilities include graduate and undergraduale leaching in hydrology and water resources, and participation in research into alther hydrological processes asaccialed with infiltration Agricultural processes and analysis and unsakuraled flow or chamical processes and anaport in the unsaturated zone. Candidate must have Ph.O. degree with demonstrated teaching stilly and scholarship. Submit resume and references to:

Water Resourcee Program Department of Civil Engineering Princeton University Princeton, NJ 08544 Princeton University is an effirmative ection/equal

Faculty Position: Department of Geology The University of Alberta. The Ceology Department has one parmanent faculty position available (subject to funding) July 1, 1982. We invite appications from qualified individuals for eppointment at the essistent or essociate professor level in any of these ereas: geomorphology, mathematical gao ogy, engineering geology, procease sedimentology and siructural geology. Preference will be given to those applicents who

demonstrate an ability to pursue a vigorous re-search program applying modern concepts and techniques in solving geological problems. The candidate is expected to teach an undergraduate course in quantitative geomorphology, course(s) in the or her speciality, including if qualified, geostatie-fee. The position also involves supervising Mesters and Ph.D. sludents. A Ph.O. is required and salary d commensurate with education and experience.
Canadian citizens and parmanent rasidents will be

given preferance. Interested applicants aboutd aubmit e résumé, publications and names and addresses of three (3) lesees to Dr. N. W. Rutter, Chairman, Capartment of Geology, University of Atbarte, Edmonton, Alberta, Canade T60 2E3. Closing date for applications & February 15, 1982. The University of Alberta to en equal opportunity

ilversity of Utshi Faculty Positions. The Department of Oeology and Geophysics invites ap-clicetions for four tenure track positions at the es-

tant to associate professor level.

J) Economic Oeology: The specific eres of experities is open, however, preference will be given to candidates whose research intereals are in geological, geochemical, or patrological characteristics of metallic mineral clandate.

2) Sedimentary geology: Applicants should heve research interests in modern or encient sedimentery basins.

3) Salamology: Applicants with backgrounds and apactelities in seterate reflection, setsmic fination or the properties.

imaging or theoraticel esismology will be given preference.
4) Potential fields: Ocophysicial with specialty

A) Potential tields: Geophysicial with specialty in potential theory including grevity and magnetics. (The closing date for this position is Januery 31, 1982).

A Ph.D. or equivalent is required. The vecencies are to be lilled by September 1992; the closing date for applications for positions 1~3 is December 31, 1981. Applicants should submill e vita, Iranscriber, and the present the content of the present to william P. Nesh, Chairman, Department of Geophysics. William P. Nash, Chsirman, Department of Ceology and Ocophysice, University of Utah. Selt Leke City, Utah 94112

The University of Utah is an equal opportunity/affirmalive action employe

Positions in Occenopraphy/VIMS. The Virginia institute of Marine Science (VIMS) School of Merine Ocience Invites applications for two slete funded, oceanography research and teaching posi-tione at the levels of Senior Marina Scientiat VIMS is a broad-based marine scienco establi with a mission to provide sound end limely advice to axaculive agencies end the legislature end to conduct incisive research programs. The School of Marine Science offers M.A. end Ph.O. programs With a laculty of 66 and 139 graduete dudents HEAO, DEPARTMENT OF CEOLOGICAL

OCEANOORAPHY (#113) Applicants are sought with research Interesto In estaurine audimentary geochemistry, dynamics of cohesive sediment trensport, or estaurine and contact Or. Robert Byrne (VIMS), 904/642-2111 [Ext. 173). ESTUARINE AND COASTAL HYDROCYNAM-

ICS (Position #204)

A physical oceanographer with a strong Interest in Interdisciplinary approaches to complex estuaring end continentel shell problems is desired. For further information contact Dr. Gruce Nailson (VIMS). 804/642-6131 (Ext. 244).

Candidates for both positions should have aslab-tished research credentists and be dedicated to lur-tharing the research and educational programs of the Institute Demonstrated ebility to generate ex-tramural support is expected. Selary renge is \$24,872 to \$34,107 and laculty rank is commensu-

Applicanta should send a comprehensive curriculum vita, raprınta, and at loast threo fettera of recommendation by Fobruary 1, 1992, slaling specific position of Interest, to Employment Managor, Personnel Office, Colloge of Wm & Mnry, Williams

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University of North Dakola. Applications nre invited for two tenuro track appointments in the Oe-pertment of Oeology, boginning January 1902:

(1) pairoleum gedogy or rolated lielda (2) one of the following areas low-temperature geochemiatry cerbonale patrology economic gaology

The first position will include teaching 1 or 2 courses for year in petrolaum geology Both posi-lions require teaching undergraduate and praduate courses in the crea(a) of expertise, directing gradu-

ale student research at the MS and PhD levels. id developing an ective research program.

The Department has nine full-time faculty, two edjunct faculty, ebout 150 undargraduoles and 5D edjunct faculty, ebout 150 undargraducies ont ob-graducte atudents. Association with the North Da-kote Oedlogical Survey Includes ecceso to com-plets subsurfeca records, cores and samples for 9,000 wells in the Williston Gasin Proximity to the Williston Gasin and Canadian Shield provides abundant opportunity for roseerch in ood/montnry, igneous, and metsmorphic patrology, and economic geology. Excellent physical lacilities, the atato core and sample library, and excellent photo, map, and

and sample library, and excellent photo, map, and book collections are available.

The Ph D. Is raquired, salary end rank are open and compositive. Applications will be accepted until autiable candidates are found. Applicants should autim complete resumes, including effectively properties. vious experienca, leaching and research interests. end of loast throo letters of inforcince to:

Or. Richard D. LoFever Chairman, Search Committee Department of Occlosy Orand Forks, ND 59202

STUDENT OPPORTUNITIES

Graduato Teaching & Research Assletantahips/University of Houston. Graduato teaching & research assistantships available to qualified persons interested in Space Physics of the University of Housian Our experimental progrom leatures rockel & balloon-borno studios el filo enosphere & magnetospheru-ronosphere coupling. Emphasis has been on active experiments, most recent being a rocket-balloon compargn of Siple station, Antorctica in Decomber 1980. Future work includes a study of pulsating aurors & participation n Welerholo II, an auroral quonching experiment The theoretical program is on plasma waves in the soler wind & modeling of phenomenn related to current experiments. Assistantships for first yenr

studenta bogin at \$600 mo etong with out of atale furtion waivers. Graduete Chairmon, Physics Dopt. University of Houston Contral Compus, Houston.

Graduate Rasearch Asalstantships in Physical Ocaanography. Opportunitins for graduoto study with Rosoarch assistantohip availabile to Studente interested in M S. or Ph.D. pro-grems A auminor progrem with elippind is open to college juniors. Writo: Douglas Caldwelf, School of Desengrephy, Oragen State University, Corvallis.

Graduata Assistantahips/Fallowships to Applied Palsomagnatic Rassarch. Oppor tunities for study, with research essistantships, avertable for atudents interested in M Sc. or Ph.D programs at the Colorado School of Minoa. Rosearch topica center around applied paleomagnetic threstigations in economic goology, structurel geology and elratipraphy-diegenesis and include such eroas as the Stiftwalor Complex, western (Conozoic volcanics plutons) and eastern (coro complexes) Seein and Rango, central Coloredo and the Powdar River Seam Students with undergraduate majors in ophysics end physics are encouraged goology, geophysics end physics are encourage to apply. Detailed information can be obtained

John Oofssman Dapartmant of Ceology Colorado School of Mineo Coldon, Colorado 60401 (303) 279 D300 Ext. 28D3

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"Detical Proporties of Clouds," a Workship Deepak This 20 page volume contains the report and recommondations of the Workshop "Clouds Their Formation, Dutical Proporties, and Effects. Williamsturg, Virginia, May 14 15, 1980, spon norml by Anny Atmospheric Sciences Laboratory and Anny Research Office Copies available from Circulation Orpt : Spectrum Press, P.O. Box 7300, Hampton, Virginia 23666 for \$150 each liptur. 4" postage and handling \$1.00 surface, \$3.00 amount

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## AGU



#### B. U. Ö. Sonnerup-New JGR-Blue Editor

JGR is the toremost place to publish research in epace hysics. You really can't be in this field without heving the journal right at your elbow, aald Bengt U. Ö. Sonnerup, the editor of the space physice section of the Journel of Geophysical Rasearch. He will formally begin hie 4-year em on January 1, succeeding George Siecoe. Sonnerup has been receiving articles for the journel eince October 1.

Sonnerup, whose research epecialty is magnetopause and became involved with megnatospheric actence when the flaid was first blooming.

What brought me here, f think it's fair to eey, was the desits to have a little bit of adventure, Sonnerup said. He hed been working in industry in hie native country before he Was accepted as a graduate etudent at Comell, where he samed his master's and doctoral degrees in aerospace enlinearing. 'My original intention was just to stay for e year. www.r. I enjoyed being a graduate etudent. In perticuler, he said. I got into contact with an exciting new fletd: maghelohydrodynamice.

Sonnarup remained at Cornell as a poatdoctoral fellow. Withing with Thomas Gold. 'It was efter I spent a year with hat f decided f didn't want to go beck into industry.' He dd however, relum to Sweden for 2 years, where he worked at the Royal frietitute of Tachnology's Department of Plasma Physics with Hannes Alfvén. I found pretty 데었어, though, that the opportunities for doing research and teaching are greater in the U.S. than in Sweden, he seld, it is true, of course, that in terms of space research of the action was in the U.S. at that time. He returned to

Now, as the Sydney E. Jenkins Professor of Engineering al Darlmouth College, Sonnerup, a theoretician, researches the structure and dynamics of the magnetopause (the boundary between the earth's magnetic field and the ion-

ized gas streeming out from the sun) and of the edjoining pleame boundary lever. In eddition to leaching and doing other research on the megnetosphere, he studies the energy-release machenism in soler tieres and the energization of charged particles et shock weves.

His experience with JGR-Blue comes not only from the numerous erticles he has published in the journal but also trom his stint ee essociete editor from 1972 to 1974. Sonnerup hopes to make a smooth trensition from the former editor to himself. In tecl, Sonnerup met with Siscoe in September to review the editorial process.

'I teel that the past editors have done on excellent job,' he emphasized. I intend to meintain the very high quelity of the ipurnal.' Sonnerup said thet once he has sellled in, he will write en editorial in the journel to explain his editoriel policy end what role he teels JGR does and should play in the spece science community. Briefly, he commented, JGR should be an integral part of the ongoing scientific process. As such, published articles should serve not only to document completed reeeerch, but elso to edvence new explenationa end hypotheses. The journal, at leest in my exparience, is quite willing to accept those hypotheses as long aa they ere clearly steted end appeal to some kind ot e sound observetional or theoretical beals. . . . The publishing of such new ideas is absolutely essential to the scientific proc-

#### **AGU** Congressional Science Fellowship

The Individual selected will spend a year on the staff of a congressionsf committee or a House or Senale member, advising on a wide range of scientific issues as

They pertain to public policy questions.

Prospective applicants should have a broad background in science, be erilculate, illerate, flexible, and able to work well with people from diverse professional backgrounds. Prior experience in public policy is not necessary, sithough such experience and/or a demonstrable Interest In applying science to the solution of

public problems is dasirab The fellowship carries with it a stipend of up to \$25,000 plus Iravel allowances.

interested candidates should submit a letter of intent, curriculum viiae; and three letiers of recommendation to AGU. For further details, write Member Programs Division, Congressional Fellowship Program, American Geophysical Union, 2000 Fforida Avenue, N.W., Wash-

Ington, D.C. 20009 Deadline: March 31, 1982.

#### JGR-Red Editor for 1983-1986 Term

Thomas J. Ahrens will complete his term as edifor of the Journal of Geophysical Research—Red at the end of 1982. A selection committee has been appointed to recommend candidates to the AGU president. Nominations for the editor for the red section of JGR for the term 1983-1986 are now being accepted. Those who are interested in serving as editor, or who wish to suggest candidates. should send recommendations by February 15, 1982, directly to

> American Geophysical Union 2000 Florida Avenue, NW. Washington, D.C. 20009 Attention: JGR Search Committee

#### Nominations for Medals and Awards

William Bowle Medal. Awarded for pulsianding contributions to fundamental geophysics and for unselfish cooperation in rasearch.

Meurice Ewing Medal. Honors an Individual who has lad the way in understanding the physicat, geophysical, end geological proceeeee in the ocean; ocaen engineering, technology, and Instrumentation: or who has given diatingulehed aervice to the marine

James B. Macelwane Awarda. Up to three awards era presented each yeer for significant contributions to the geophysical sciences by a young scientist of outstanding ability. Recipients must be less than 36 years old.

Robert E. Horton Medal. Awerded for outstanding contributions to the geophysical espects of hy-

Letters of nominetion outlining eignificant contributione and curriculum vitae ehould be eant directly to the eppropriate committee chelrmen: Bowle Medal-George D. Garland, Department of Geophysics, University of Toronto, Toronto 5, Ontario, Canada; Ewing Medal Robert O. Reld, Department of Oceanography. Texas A & M University, College Station, TX 77843; Macelwane Award-Manik Telwani, Lamoni-Doherty Geological Observatory, Palisadse, NY 10984; Horton Medal-Peter S. Eagleson, Department of Civil Engineering, Bullding 48-335, Massachueette Institute of Technology, Cembridge, MA

DEADLINE FOR NOMINATIONS IS DECEMBER 15, 1981

THE OHIO STATE UNIVERSITY

The Department of Greeksty and Mineralogy invites applications for letture track po-

HYDROGEOLOGY AQUEOUS OR ORGANIC GEOCHEMISTRY GEOPHYSICS OR SEISMOLOGY SEDIMENTOLOGY OR SEDIMENTARY PETROLOGY Ph D required Successful applicants will be required to leach graduate and under

Columbus, Ohio 43210.

graduate courses and conduct research. Positions open Fell of 1982, possibly sooner. Rank and salary dependent on qualifications. Send resume, with statement of research record and inferests and arrange for all least three letters of references to be sent to. Peter-Noel Webb, Chainnen Department of Geology and Mineralogy 107 Mendenholl Loboratory 125 South Oval Mall

by or before February 1, 1982. Further information on these positions may be obtained by calling [614] 422-2721. An equal opportunity affirmative action employer.

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## Meetings

#### Penrose Conferences

Threa Penroso Conferences were recently ennounced by the Geological Society of Americe. Conference titlas are 'Tectonic History of the Ouachita Orogen,' 'Origin of Fluids and Metols in Porphyry end Epithermni Minoral Doposits, end 'Models of Diagenesis in Clastic Reservoirs.'

Sleled for May 23-28, 1982, of DeGray Stato Park Lodge in Arkedelphie, Ark., Tectonic History of the Ouechile Orogen' will leature discussions on the environments of deposition and tectonic fremework of Early to Middle Paleozolc strata; provenence end tectonic fremework of the cerbonilerous flysch; the Penton-Broken Bow uplitt es a subduction complex; and the regionel tacionic satting of the Ouachite grogen. The conference will include a lield trip in the Ouachita Mountains eurrounding DeGray Dam and Leke Ouechile. An optional field trip will be conducted Mey 23, before the contarance begins. to the eastern outcrops of the Quachtla Mountains in Arkansas. The Quachtle orogenic beli extends from the southwastern Appalachlans to the Merathon region of Texas and into Mexico.

To ellend, conloct either ol the convonors, Williem A. Thomes or George A. Viele, by Februery 15. Indicate your Interest in the conference end in the optional field trip. Also, dascribe areas of discussion to which you can contribute. Write to Thomas, Dapertment of Geology, University of Alabama, University, AL 35486, or lo Viole, Dopartment of Geology, University of Missourf, Columbia, MO 65211.

The conforonco 'Origin of Fluids and Methis in Porphyry and Epithermal Minorel Doposits' will be hold August 8-13. 1982, at the Holidny Inn In Dillun, Colo. Topice to be covnred include the environment's role in the emplacement of plutons in the upper crust; the relation of the motal centent and inflorni assemblingos of doposits to plutons; the doduction of the chornical neture of intruding magmas from tha rosulting plutons; and the conditions under which a plu-Ion will produce e perphyry-type doposit, e vein daposit, or both. Two 1-day field trips will include surface tours of tha Ideho Springs Cantrel City and Jameetown mining districts end an underground tour of the Henderson molybdonite deposit. There will be optional hull-day surface tiald trips to other mining districts in control Colorado.

Applications to atland the conference should be sent to Jim LoAndorson, Department of Goological Engineering. Colorado School of Mines, Golden, CO 80401; deadline is April 20. Persons Interestad in giving an ural presentation or a posier sassion should submit a title and topic description by Fabruary 28. Convenors are LaAnderson, Steva Ludington, and Art Bookstrom.

'Modots of Diaganesis in Clastic Reservoirs' is schaduled tenletively for August 15-20, 1982, in Kailua, Kona, Hawoti, tollowing the Clay Mineral Society Annual Meeting on August 8-14 in Hilo, Hawall. The contaranca will examine diagenatic models pertaining to reservoir rocks. Emphasis will be on the tamporel end spattel distribution of eltaration products in ectual reservoirs and on theoretical models of heet, mass, and fluid llow.

To eltend, contact J. R. Wood, COFRC, P.O. Box 446. Le Hebra, CA 90831; deadlina is April 30. Includa a briet dascription of topics to be contributed end the reason for wanting to attend. Convenors of the confarence are Wood; len Hutchaon, Daperimant of Geology. University of Calgary, Calgary, AB, Canada, T2N 1N4; and J. R. Bolas, Departmant of Geology, UCSB, Senta Berbare, CA 93017.

#### **National Water Conference**

Representetives from the Academy of Naturel Sciences. the American Weter Works Associetion, end the Water Pollution Control Federetion will coneider how euccesstul the United Steles hes been in its approach to water poliution control end other questions releting to weter quelity end the Cleen Water Act during the Netlanel Water Conference to ba hald in Philedelphia, Pe., January 26-27, 1982.

The purpose of the conference le to compila ecientific intermetion on whet hes been echieved by the Cleen Weter Act. 'Thie information can be of use to environmentally concarned people, industry, end lewmakers during their forthcoming deliberations on the tuture of the netion's water pollution control lews, according to Ruth Patrick, cheirman of the conference plenning committee.

For additionel information, contect Jemes Wilson, Secretery. The Netional Weter Conference, Academy of Netural Sciences, 19th end the Perkwsy, Philedelphie, PA 19103 (lelephone: 215-299-1107), \$5

#### Travel Grants to IAG **General Meeting**

Deadline for Applications: January 1, 1982 AGU has applied to the National Science Foundation for a grant to assist the travel of individual U.S. scientists In the General Mceting of the International Association rd Genniesy, to be held in Tukyu, Japan, May 7–20, 1982. Application furns for the grants are available from Memtier Prugrams Divisiun, American Geophysical Union, 2000 Flurilla Avenue, N.W., Washington, D.C. 20009 (tclephune 202-462-6903 or toll free 800-424-2486).



be the victim!

AGU FALL MEETING

## **Environmental Engineering Conference**

A cell lor pepers has been Issued for the 1982 National Conference on Environmental Engineering, slated to July 14-18, 1982, et the Sheraton-Ritz Holet in Minneapols,

Pepers on the following topics ere especially requested: eir quelity, noise poliution, nuclaar weste menegement to id weetes, toxic end hazerdous westes, weter policien, and weter supply and trealment.

Abetrects of epproximetely 500 words should include the title of peper; title, effilietion, end address of the euthor or authors (Indicate which person will present the paper); the epproximete dete when the work was or will be complete. end, it epplicable, if the work has been published or will be published elsewhere by July 1, 1982. Four copies of abstrects should be eent to Walter K. Johnson, Conference Chairman, Metropoliten Waste Control Commission, 350 Metro Squere Buliding, St. Paul, MN 55101. Abstrects postmarked on or before December 18 will be eccepted for review. Additionel information may be obtained by calling Johnson (lelephone: 812-222-8423).

The conference le sponsored by the American Society of Civil Engineers (Environmental Engineering Division) in cooperation with the University of Minneagte Department of Civil and Minerel Engineering, the Minnesota Poliution Control Agency, the Centrel States Water Poliulion Control As societion, and the Minnesota section of ASCE. 30

#### Princeton University Short Course



This course will cover fundamentals of the physics of flow through porous media, emphasizing problems arising in groundwater hydrology, oil reservoir engineering, contaminant transport, geothermal engineering, and soil physics. After developing the methodulogy for obtaining the balance laws of interest, the seminar will focus on numerical methods for solving the resulling portial differential equations. Case studics and hands-on computing experience will be included. The lectures will be given by Professor George F. Pinder.

For information please confuct: Or George F. Pinder
Dept. of Civit Englaceting [cide 123] Princelon University Princeton, N.J. 08544

Fundamental Concepts in Modelling Fluid Flow and Solute Transport in Porous Media

January 26 - 29, 1982

## GAP

#### **Geodasy and Gravity**

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#### Hydrology

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ML. Karvan School of Clvil Engineering, Ardme
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# 1160 Sunoif and Stression STOCHASTIC TRIGGES MODEL FOR THE FLOOD SEAKS, PART I. PEYELOPHENT OF THE STOCHASTIC TRIGGES

SOPEL Xavas lechool of Civil Engineering, Purdus

1. Xavas lechool of Civil Engineering, Purdus

Iniversity, P. Laiayetta, IN 479011

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COMELNING INTE-SPECIFIC AND REGIONAL INFORMATION AN EMPIRICAL EATER APPRACE

G. Succars Department of Civil Engineering,
Monash bairusity, Clayton, Victoyia, 1820.

Empirical Sque theory, adapted to a hydrelogic contest, is made to derwipe procedures for inferration by decided in a dermine the procedure of the contest, is made to derwipe procedures for inferrations of the procedure of the contest, is made to derwipe procedures for inferrations at a particular Newson to be prove upon inferrance at a particular Newson to be prove upon inferrance at a particular Newson to the prove upon inferrance at a particular less. The superpopulation is a key cancept in the depriving Hayran spirock, it is a probability distribution from conseptabilitation clonal; relief of regionality and institution of the superson. The degree of basin which had not a superson to the degree of basin historical is a section. The superson is a spirital superson to instruments and the section is a superson in the section of the superson in the su

### Mateorology

171P (Boundary Layer Structures and Processes)
LONG CLOUP OBSERVATIONS ON MASS AND DEPLICATIONS
POR BOUNDARY LAYER CHARACTERISTICS OVER SLOPES
8. Kahn, P. Olsraset | Cantar for Radiophysics and
Sprea Research, Cornell University, 1thers, Sex
Tork, 14853]

White orbits longer of Here show severs in-erances of long continuous cloud formations on the slopes of Arela sed Pavonia Mons. We have searched sil the larges of the planet for occur-rances of such formations. Only in the Thereia region was long clouds enambiguously identified. We have nessured the times sed legations of ocregion were long clouds anambiguously identified. We have measured the times sed isoactons of occurrance, the wavelengths and when possible, the apparent valonity of notion of these clouds. We have also tableted the wavelengths of patches of rippis cloude which are often toach with the long forcations. The long plouds are observed only in the serie morning hours, suggesting that they are associated with drainage winds due to a cold pismatery boundary layer. We develop simple settematical models to examine various aspects of such boundary layer winds; these sliows at to construct a complete and self-consistant asplantion of all the chooswed instructs of the clouf formations. We use the results to characterize some physical properties of the Mara boundary layer as atrong downslope flow in the boundary layer as a the high alopes of both volucions. In the saddle region herween the peaks the flow slowes and undergoes a hydroulic jump, producing the long clouds. Downstream of the jump, producing the long clouds. Downstream of the jump, producing the long clouds. Downstream of the jump, with a section of the jump with the account for the region in their character are exclude by flow over surfact irregularisingth behind the jump may he attributed to reviation in the first spaed and depth, Pinelly, we can account for the location of the jump by the waristion of relative acressath of the boundary layer ilows on the two volcanon. (Maraalmosphere, sidpe winds, houndary layers).

J. Geophys. Rea., Siue, Paper LA156)

3715 Chesical composition and chemical inter-A TIME SERIES ANNUTSIS OF UNKER BALL FROM AROSA A TIME SERIES ANALYSIS OF DAKER BALA-FROM AROSA
J. E. Perrety Lif P. Colen, and R. W. Hensing
Lawrence Liversore Labovatory. Liversore,
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A fine-marine attempressive-moving oversor
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assined. No algorificant trend is found of the % significance level.

Notes are then refit for the entire emple which and detection thresholds are estimated for line periods eftay December 1911. Incharge in 03 due to trend over the next lengths solid need to be as large as 3.%, 10.6%, and 23.% In levels 7, 8, and 9, respectively, in order for issite based on these models to conclude there was a significant nonzers trend in the future. The irred in the summed dels would need to 5.%. Thus we find that the date in their level 7 provide the smallest dates in their level 7 provide the smallest dates in upper level 9). The datestion broshold found here are conpend to delsection broshold found here are conpend to delsectability limits from total by sits.

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The first desired expectations of fighteing rature troke electrics and magnetic fields above from the first of the statistic and magnetic fields above from the first of the statistic and magnetic fields above from 20 m to 10 km. These waveforms tre computed using the model of tin et al. (1980) and a modification of the statistic fields with he left above ground. Both the signal and the modified models result in starter prediction of measurements above from and close to the sincke, with which the calculations could be somewed to less the middly of the model, have only at been made, lefted aspects of the calculated fields are discussed, including their was to collbrating from an including their was to collbrating from and and aritherno datp.

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Its first-ical Phanomera
RE MYMOCHEE OF SPACE CHARGE SPECTRA OR
ALIEUS CONCENTRATIONS
L. K. Anderson (Code 4325, Mayai Research
Labritory, Washingtee, DC 20375)

The theoretical behavior of strospharit space
charge in a float of turbulont mixing is reviewMi, and the partible unofulness of space sharge
is a tracer of the iurbulont process is letroduced. It is shown that power spectra of space
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Wis Flectrical Phenomena
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J. K. Bosen (Department of Physics and Astronomy,
Mintriky of Physics, taranta, My 88071)
An Atmospheric Electrical Measurements Morkshop
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R.I. ACBORDIA, C.K. Beni, and R.A. Duce (Creder
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School of Oceanography, University of Rhope
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J. Geophya. Roas. Oreen, Papar 101638

AMALYSIS OF TOTAL OZOME DATA LOS THE DELICATION OF RECENT TREMES AND THE FIFTCHS OF NUCLEAR TOTALES OF THE PROTECTS OF NUCLEAR TOTALES.

PURING THE 1960's

C. C. delinned loppartment of Statistics, University of Misconsin, Madison, Ulaconsin, N70b)

Time series bodied to do control related coone data is considered for the detection of changes in oxone due to the possible offects of nuclear weapons resting in the series labo's and mayor recome effects of the release of chinolistromethadom (CFNe). Based on oxone data from a network of series of this mentysin are consistent with a maximum derenant in Initial oxone in the morthern hontaphere of approximately 2 to 4.57 due to nuclear testing offects in the certify 1900's. More importantly, our findings show little evidence of any significant trend to global tolal oxone courring in the 190's, wills the global change during 1979-1979 estimated as 1.294 i. 1.51°. Total oxone, time arties width, nuclear weapone restling effects, trends). nuclear weapone realing effects, trends Scophys. Res. Lett., Paper 11162

#### Particlas and Fialds— Interplanetary Space

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Feloberg, S. T. Shoeri, J. L. Stelpberg and
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V.I. Rogalsky, V.M. Parmanov, and
V.K. Shtrykov (Institute of Radio Regineering and Ricotronics, the USER Academy
of Sciscoes; 103907 Mark Avenue 18;
052-3, Mosdow, USER)
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to the Kolmogorov value of 11/3 et the
distance greater than 20 2 and 15e,
value is significently smaller (3,040,2)

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#### Particles and Fields ionosphare

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calculations are made of tre currents and
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#### Physical Properties of Rocks

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L. S. Mai (Masali Institute of Geophysics, Intersity of General, Homoidu, Haveit 96572).
J. H. Kingmann and Y. W. Karabers Coppensional wise attenuation, Q<sub>p</sub><sup>-1</sup>, and volocity, V<sub>p</sub>, doe an alialic oliving bessel have been cresured from 1250° to 1530°C sed from 6 to 10 Hz by an ultraconic interferometric technique. volocity, Vp. 400 an attaint of this Resert have been createrfd from 1250° to 1550°C and from the 10 Mts by an officialistic interferometric technique. In shows no significant frequency or temperatura dependence, and Optimizations with increasing frequency and declareing temperature. For the conditions of this study, the meltican he modeled as a viaconiastic marcrial with a single thermaily activaried structural relevation sechanics having an activation energy of 2.2 eV and a relevation of the order of the transfer of the frequency, i. In such mailter than the relevant of the frequency, i. In such mailter than the relevant in proportional relevance in a shapping of the date compared that ill compressional wave losses will be negligible to a bassit celt at selvate frequency, and 121 the volume viaconity of bassit to comparable in magnitude to shear viacosity. Freek mail; sitrawark attenusion, velocity. perthon, ken, lett., tacer 1115t2

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#### **Planetology**

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8359 Miscellancous Planetelegy 5
VENUS SIGNETHE CONSTRUCT BOLZE: THE SIGNATURES
OF PARALLEL ELECTRIC FIELD ACCREEATION EXCHOUS:
J. M. Crebowky Both at Mana/Godderd Space
Plight Center, Greenheit, Marpheed, 10171), S. C.

Fright Catter, Greechalt, Marpised, t0171), S. C. Cartis

Eacunt observations by the testroscess enhand the Finness Semme speces set them yeareded the calatesce of Tholes of magicus of density deplacies in the sightelds Passer imposphere loyace at al., 1981). These belee are cascaleted with regions of redist magestle timids [Lubmann as al., 1981). The properties of the significant set of the search of the es atteleration process along the magnetic tield lines me are the Wemmer 5 and 10 observations of emognic tens is the Sense tell. Gives the phenyrational information, as hame constructed a theory which attributes these Sequetion present depletions to the presence of parallel discirte fields staliar to those abserved in the terreerising similar to these sheered is the terres-trial sustored lonospheye. The revising electric tield retaierases electrons down the field itnes producing heating of the depicted thermal alec-trus population withis the hele and production of inciration below the heir. Similantonally long-spheria loss are accelerated netward tward the plasneskiet. Geophym. Rue, Latt., Paper tilbli

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IGOVIGETES OF AMERICA PLASTICA REGION OF MARS
Payld U. Scatt and Ensueth L. Tausha lir.5.
Coological Survey. Fingalatt, AZ 86001)
4 caylee of rock wells resoluting inyteoirful
lightabylica in their tirgs evolut propeytica has
been excepted in the Americal Plantite region of
Mars. The postulated ignishring cerey may then vest sing the highland-levined boundary. They overlie parts of the emercia materials of Sympos Neas hat are unbeyed and Syrringed in places by Lare pinion of the levineds. Stratigraphia

iars picine of the levisode. Stritigraphic selections between the incidence, Stritigraphic selections between the incidence are not clearly from Thereia Mostre religious are not clearly defined but the younger incidential probably posteds; the lave Flows. They Pure parenters, selectively flat shears that have mooth to gestly undustriag serface very similar to makefice tusts of the Fancake Ranga to Seatral Movade. The new Yesistant, possibly delided, layane have lireay grooves and ridgey their appear to be compliantery joint seats as shed by the wind. Four major cruptive tenters, some with probable weste, dre tenalized where the ignihalize are thickes. (Ignihalizes hear 181699)